SKYLIGHT SYSTEM

The present invention relates to skylights adapted to be fitted to the roofs of buildings and, more particularly, to methods of construction and fitting of such skylights.

BACKGROUND

Skylights, let into roofing, have long been used to provide a source of light into the interior of a building. Skylights may be fixed or openable and may be adapted to provide ventilation as well as light. Skylights known in the industry suffer from a number of disadvantages.

At least some commonly available skylights of overseas manufacture may not conform to required standards of traficability, that is of being capable of supporting the weight of a person traversing the skylight, both in the strength of glass employed and the strength of frame construction.

Another problem commonly encountered in skylights intended to allow ventilation is that they do not adequately prevent the ingress of debris and in particular may not be proof against flying embers.

In addition, many available skylights require considerable on-site fabrication and are time consuming to install.

It is an object of the present invention to address or ameliorate at least some of the above disadvantages.

BRIEF DESCRIPTION OF INVENTION

Accordingly, in one broad form of the invention there is provided a skylight system including a prefabricated mounting frame and a prefabricated hood assembly, adapted to assemble together to form a skylight.

Preferably said prefabricated mounting frame comprises a rectangular arrangement of extruded sections.

Preferably said extruded sections are provided with bottom flange portions adapted to seat on the batten timbers of a sloping roof.

Preferably said extruded sections are provided with a pair of closely spaced projecting flanges adapted to accept and retain pre-assembled flashing elements attached to said extruded sections.

Preferably said flashing elements along the two sloping sides of said skylight, comprise roll-formed metal strips, said roll-formed strips adapted to interface with roof covering material.

Preferably said flashing elements along the two horizontal sides of said skylight comprise malleable metal strips.

Preferably said prefabricated mounting frame is provided with sprung retainer elements attached to each of the extruded elements forming the sides of said rectangular support structure.

Preferably said sprung retainer elements are in the form of bent metal strips with the lower ends of said strips forming an angle with said sides of said rectangular support structure, such that said lower ends deflect inwardly from said sides.

Preferably said extruded members are provided with an horizontal ledge extending outwardly from said extruded members, said horizontal ledge adapted to support a sealing strip, said sealing strip forming a perimeter seal around the top of said prefabricated mounting frame.

Preferably said prefabricated hood assembly includes perimeter capping, glass layers, internal sash frame, extruded seal elements and extruded clamping members.

Preferably said perimeter capping is fabricated from extruded elements adapted to provide framing of said glass layers and support for said clamping members.

Preferably said internal sash frame is retained within said perimeter capping by said clamping members, said clamping members provided with a clamping ledge adapted to

engage in grooves provided in the outer faces of said internal sash frame.

Preferably said extruded seal elements provide support for said glass layers.

Preferably said glass layers are clamped between said perimeter capping, said extruded seal elements and said internal sash frame by said clamping members.

Preferably said clamping members are fastened to said perimeter capping by self tapping screws.

Preferably said prefabricated hood assembly is adapted for assembly with said prefabricated mounting frame so that said internal sash frame locates within said prefabricated mounting frame; said clamping members seating on said perimeter seal.

Preferably said prefabricated hood assembly is retained in sealing engagement with said prefabricated mounting frame by means of said sprung retainer elements engaging in recesses provided in the outer surfaces of said internal sash frame.

Preferably said prefabricated mounting frame is provided with an extruded hinge section; said hinge section adapted to be a clip-on attachment to one of said extruded sections of said prefabricated mounting frame.

Preferably said hinge section includes an extruded lobe element, said lobe element being of substantially circular section and further including a convex extruded arcuate guide segment concentric with said lobe element.

Preferably at least one of said extruded elements of said perimeter capping of said prefabricated hood assembly includes an extruded hinge element of partially cylindrical form and a concave extruded arcuate guide segment concentric with said hinge element, said hinge element and said concave extruded arcuate guide segment adapted to mate with said lobe element and said convex extruded arcuate guide segment so as to allow rotation of said prefabricated hood assembly about said lobe element when one of said extruded hinge elements of said perimeter capping is assembled with said lobe element.

Preferably the degree of rotation of said prefabricated hood assembly is controlled by a latching mechanism within the limits of rotation allowed by said extruded lobe element, said extruded hinge element and said arcuate guide segments.

Preferably said prefabricated hood assembly is provided along one side of said perimeter capping with a raised cowling, said cowling provided with an opening facing out over said glass layers.

Preferably said cowling is provided with a hinged flap, said flap adapted to provide closure means for said opening.

Preferably said hinged flap is provided with extruded element along its upper edge adapted to mate with extruded element at the upper edge of said opening of said cowling, so as to allow said hinged flap to rotate between a first open and a second closed position.

Preferably the status of said hinged flap is changed from closed to open by means of the outstroke of a solenoid actuator.

Preferably the status of said flap is changed from open to closed by means of the instroke of said solenoid actuator and a return spring.

Preferably said cowling houses an electrically driven exhaust fan assembly.

Preferably said extruded seal element is of the form of an extruded strip, said strip provided with a plurality of co-extruded ridges on a first side of said strip and a projecting co-extruded tongue on an opposite side of said strip.

Preferably said co-extruded ridges are broached at intervals by a post-extruding operation to allow the passage of water condensate.

Preferably said extruded strip is provided with through holes, punched through said strip in a post-extruding operation to allow the egress of water condensate.

BRIEF DESCRIPTION OF THE DRAWINGS

Embodiments of the present invention will now be described with reference to the accompanying drawings wherein:

Figure 1 is a perspective view of the a skylight system according to a first preferred embodiment of the invention,

Figure 2 is a sectioned view of the higher end portion of the skylight system of figure 1,

Figure 3 is a sectioned view of the higher end portion of figure 2 and the opposite lower end portion of the skylight system of figures 1 and 2,

Figure 4 is a perspective view of a prefabricated mounting frame of the skylight system of figure 1.

Figure 5 is a part side section view of a second preferred embodiment of a skylight system according to the invention in a first, closed position,

Figure 6 is a part side section view of the embodiment of figure 6 in a second, opened position,

Figure 7 is a perspective view of a third preferred embodiment of the invention,

Figure 8 is a part side section view of the embodiment of figure 7 in a first, open position,

Figure 9 is a part side section view of the embodiment of figure 7 in a second, closed position,

Figure 10A to 10C are perspective views of a preferred embodiment of a component of the skylight system of the invention, and

Fig. 11 illustrates a preferred embodiment of the skylight system with flashing elements interposed with roof tiles.

Figure 12 illustrates a preferred embodiment of the skylight system adapted for installation to a corrugated metal roof.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

First Preferred Embodiment

A first preferred embodiment of a skylight system 10 according to the invention will now be described with reference to figures 1 to 4. A prefabricated mounting frame 20 is constructed from extruded sections 21 to form a generally rectangular support structure 22 as may best be seen in figure 4, and is provided with bottom flange 23

adapted to rest on the batten timbers 24 of a roof as shown in figure 1. The upper edge of extruded section 21 is provided with a horizontal top ledge 41 adapted to accept sealing strip 44.

Extruded section 21 is further provided with projecting flanges 14 adapted to receive flashing elements 15, 16 and 16A as shown in figure 4. Flashing elements 15, 16 and 16A are pre-assembled with rectangular support structure 22 by crimping flashing 15, 16 and 16A between the projecting flanges 14 so as to allow integration of the flashing with roofing material such as tiles when installing the skylight system 10.

In at least one preferred embodiment of the invention a silicon or other suitable sealant 52 is introduced into the space between the flanges 14 prior to fully inserting the flashing 15, 16 and 16A. In this process, the flashing is firstly inserted a short distance into the flanges and the sealant injected through a series of pre-drilled holes 51 from the inside of the frame as shown in the inset of figure 2. Optionally, overlapping portions of flashing elements 15, 16 and 16A extending outwardly from the support structure may be fastened together by any suitable means including rivets, welding and the TOX® fastening system.

In a preferred embodiment of flashing 15 adapted for use along the two sloping sides 17 of skylight system 10, flashing 15 is fashioned out of malleable metal sheeting roll-formed to a profile adapted to suit the configuration of roofing material as shown in figure 1A. Flashing along the upper and lower horizontal edges 18 and 19 of skylight system 10 is fashioned from conventional malleable flat sheeting.

In this first preferred embodiment, a prefabricated hood assembly 25 comprises a perimeter capping 26 formed of extruded elements 27 and internal sash frame members 28 forming a rectangular sash frame 29 within perimeter capping 26. The sections of sash frame members 28, along the two sloping sides and the high side of the frame are formed with raised portions 50 which act to nest glass layers 30 around three sides of the glass.

Glass layers 30 are held in a clamped position between perimeter capping 26 and sash frame 29 by means of clamping member 31. Clamping member 31 is provided with clamping ledge 32 which engages groove 33 of sash frame 29. Self-tapping screws 34 pass through holes 35 in clamping member 31 to engage with a projecting member 36 of extruded element 27.

In this instance, glass layers 30 are supported on extruded seal element 38 held in place by extruded tongue 43 located in groove 37 of sash frame member 28. As shown in figure 3 glass layers 30 are further supported at the lower end of perimeter capping 26 by extruded buffer 47.

As explained in more detail below, extruded seal element 38 underlying the lower edge of glass layers 30 is provided with channels as shown in figures 10B and 10C through ridges 46 so as to allow condensation collecting on the underside of the lower glass panel to flow downwardly to pass through these channels and drain through holes 48 and mating holes 45 in clamping member 31.

Rectangular support structure 22 is provided along each of its four sides with sprung retainer elements 39, attached to the extruded sections 21 by fasteners 40. As can be seen in figure 2, retainer elements 39 are so constructed as to engage in recess grooves 41 of sash frame 29.

It will be clear that with suitably sized components, prefabricated hood assembly 25 may be inserted into rectangular support structure 22 so that initially sprung retainer elements 39 will be deflected to allow the sash frame 28 to enter rectangular support structure 22 to a point where clamping members 31 are seated on sealing strip

44 and retainer elements 39 deflect inwardly to engage recess grooves 41 so as to lock sash frame 29 in position.

The angled sections of retainer elements 39 are provided with slots 43 as can be seen in figure 3. Should removal of prefabricated hood assembly 25 be required, access holes may be drilled through extruded sections 21 opposite the slots 43 so that, with a suitable tool, sprung retaining elements 39 may be pulled outwardly to disengage from recess grooves 41.

The method of construction of this first embodiment of the present invention, allows access to the internal surfaces of rectangular support structure 22 for the purpose of strapping support structure 22 to structural supporting members of the roof to which the skylight is to be installed.

With reference to figure 11, a typical installation of skylight system 10 shows the disposition of flashing elements 15, 16 and 16A interposed with roof tiles 49 (shown as dashed lines). At upper horizontal side 18, flat malleable flashing 16 lies under the row of roof tile 49a, while at lower horizontal side 19 flashing 16A overlies the row of roof tile 49e. Roll formed flashing 15 remains below roof tiles 49a, 49b, 49c and 49d but is deformed at approximate position 'A' to deflect upwardly to emerge

between roof tiles 49d and 49e and overly roof tile 49e. Note that the inner edge of roll-formed flashing 15 remains crimped between projecting flanges 14.

In at least one preferred embodiment of the invention the flashing elements 15, 16 and 16A are formed of "O" tempered aluminium sheet. This material is malleable but cannot be stretched during installation on site. For this reason the flashing 16A extending from the lower end 19 of support structure 22 is prepared prior to assembly by the pressing of corrugations or flutings 55 along its lower edge and extending approximately half the width of the sheet comprising the flashing element as shown in the inset of figure 11. Preferably a pressed-in indentation 56 is formed substantially along the length of the flashing to minimise distortion of the flat edge portion to be inserted into the flange portions of the frame 22.

This corrugating or fluting process in effect provides additional material along the lower edge of the flashing element. This additional material allows for the conforming of the lower portion of the flashing to the profile of the tiles by tamping blows with a suitable mallet.

Thus installation time is minimized by the ability to install rectangular support structure 22 and attached flashing elements 15, 16 and 16A and the simple insertion

of the prefabricated hood assembly 25 once the rectangular support structure 22 is fixed in position.

Second Preferred Embodiment

A second preferred embodiment of a skylight system according to the invention will now be described with reference to figures 5 and 6 wherein like elements of the first embodiment are similarly numbered but with the addition of 100 so that for example feature 22 of the first embodiment is referenced as feature 122 in the second embodiment.

Accordingly there is provided a rectangular support structure 122 fabricated from extruded sections 121 and provided with flange elements 123 to allow structure 122 to be positioned on roof battens 124. As for the first embodiment already described, the extruded sides of structure 122 are provided with projecting flanges 114 to allow the pre-assembly of flashing (not shown) along the two sloping sides of skylight system 100 and conventional malleable flat flashing 115 along the upper and lower horizontal sides.

Extruded sections 121 in this embodiment are so formed as to allow the clip-on attachment of an extruded hinge section 143. Preferably hinge section 143 will be attached

to the upper horizontal side of structure 122. Hinge section 143 is provided with an extruded hinge lobe 144 and arcuate guide section 145.

In this second preferred embodiment perimeter capping 126 is provided with extruded hinge trough 146 and extruded arcuate guide follower 147. Prefabricated hood assembly 125 includes upper sash frame 129 which clamps glass layers 130 against perimeter capping 126 by means of clamping member 131 and self-tapping screws 134.

With reference to figure 6 it will be observed that prefabricated hood assembly 125 may be rotated into an open position relative to rectangular support structure 122 about extruded hinge lobe 144. Prefabricated hood assembly 125 is constrained to rotate about extruded hinge lobe 144 as long as extruded arcuate guide follower 147 remains in contact with arcuate guide section 145. This contact may be maintained by restricting the opening of prefabricated hood assembly 125 with a suitable latching mechanism (not shown) such as commonly found on hinged sash windows.

For installation of this second embodiment of the invention, the rectangular support structure 122 is firstly positioned and fastened to the roof structural members as was the case for the first embodiment described above. Prefabricated hood assembly 125 is then hooked into

position with hinge trough 146 around hinge lobe 144 and rotated to its closed position. In use the aforementioned latching mechanism allows the opening of the hood assembly as desired.

Third Preferred Embodiment

A third preferred embodiment of a skylight system according to the invention will now be described with reference to figures 7 wherein like elements of the first and second embodiments are similarly numbered but with the addition of 200 so that for example feature 22 of the first embodiment and 122 of the second embodiment is referenced as feature 222 in this third embodiment.

Accordingly, in figure 7 rectangular support structure 222 is located on roof battens 224 as before resting on flange elements 223. In this embodiment prefabricated hood assembly 225 is provided with cowling 250. Cowling 250 is provided with opening 251 and hinged flap 252.

As shown in figure 8, hinged flap 252 is hinged by means of hinge arrangement 258 wherein extruded element 259 of cowling 250 is so formed as to provided rotational support for mating extruded element 260 of hinged flap 252.

Again with reference to figure 8, contained in cowling 250 is motor and fan assembly 260 where barrel fan 253

extends parallel to opening 251 of cowling 250 with fan motor 254 located at one end of the fan. When in ventilating mode, solenoid 255 outstrokes rod 258 to force flap 252 into its open position and barrel fan motor is switched on. Barrel fan 253 now acts to draw air from building interior 257 and expel it through opening 251. When not in ventilating mode, barrel fan motor is switched off and solenoid 255 retracts rod 258 allowing flap 252 to close under force from a return spring (not shown).

Extruded Seal Element

With reference to figures 3 and 10, extruded seal element 38 will now be more fully described. A problem with sealing elements of prior art is that these are generally injection moulded from elastomer material requiring specific moulds for every differently dimensioned skylight assembly. The method of seal manufacture here described overcomes this disadvantage.

In a first procedure profile 300 is extruded of indefinite length as desired from elastomeric material such as rubber, neoprene or the like as shown in figure 10A. In a subsequent operation ridges 301 are provided with drainage channels 302 either by mechanical milling or by

hot melt methods (figure 10B). Finally punched drainage holes 303 are provided at suitable intervals (figure 10C).

Fourth Preferred Embodiment

In a fourth preferred embodiment of the present invention, a system of flashing is adapted specifically to the fitting of any of the skylights described herein above to a corrugated metal roof.

As also described above, the rectangular support structure is pre-assembled with upper and lower and side flashing elements inserted into the extruded flanges and sealed with a suitable sealant. The arrangement is shown in figure 12.

As shown in figure 12 the pre-assembled flashing 316 at the high side of the skylight 300 is joined to the metal of the corrugated roof 325 by means of corrugated flashing element 320. Flashing 316 in this embodiment is provided with an upwardly folded edge portion 330. Corrugated flashing element 320 is comprised of malleable aluminium sheet which is prepared with corrugations to match those of a corrugated metal roof along its higher edge 322 and provided with a fold over portion 321 at its lower edge 323 adapted to fit over upwardly folded edge portion 330. The corrugated edge 322 may be placed over the sheeting of roof

325 with suitable sealant as shown in figure 12 or positioned under it as shown in the inset of figure 12. Although shown in figure 12 as upwardly folded, edge portion 330 and 321 may be folded further as shown in the inset of figure 12 so as to lie flush against the surface of flashing element 316.

A similar arrangement is used to connect the lower end flashing element 316A to the sheeting of roof 325 with corrugated flashing element 340. Corrugated flashing element 340 is provided at its higher edge with fold over portion 341 adapted to mate with folded under portion 342 of the lower edge of flashing element 316A. The lower edge of corrugated flashing element 340 is prepared with corrugations to match those of the corrugated sheeting of roof 325.

It will be appreciated that the location of corrugated flashing elements 320 and 340 is determined by the corrugations of roof sheeting whereas the location of the skylight may be determined by the location of the timber structure of the roof. The fold over portions 321 with folded edge portion 330, and fold over portion 341 with folded edge portion 342 allows sideways adjustment of the connecting flashing elements and the pre-assembled skylight flashing.

The above describes only some embodiments of the present invention and modifications, obvious to those skilled in the art, can be made thereto without departing from the scope and spirit of the present invention.

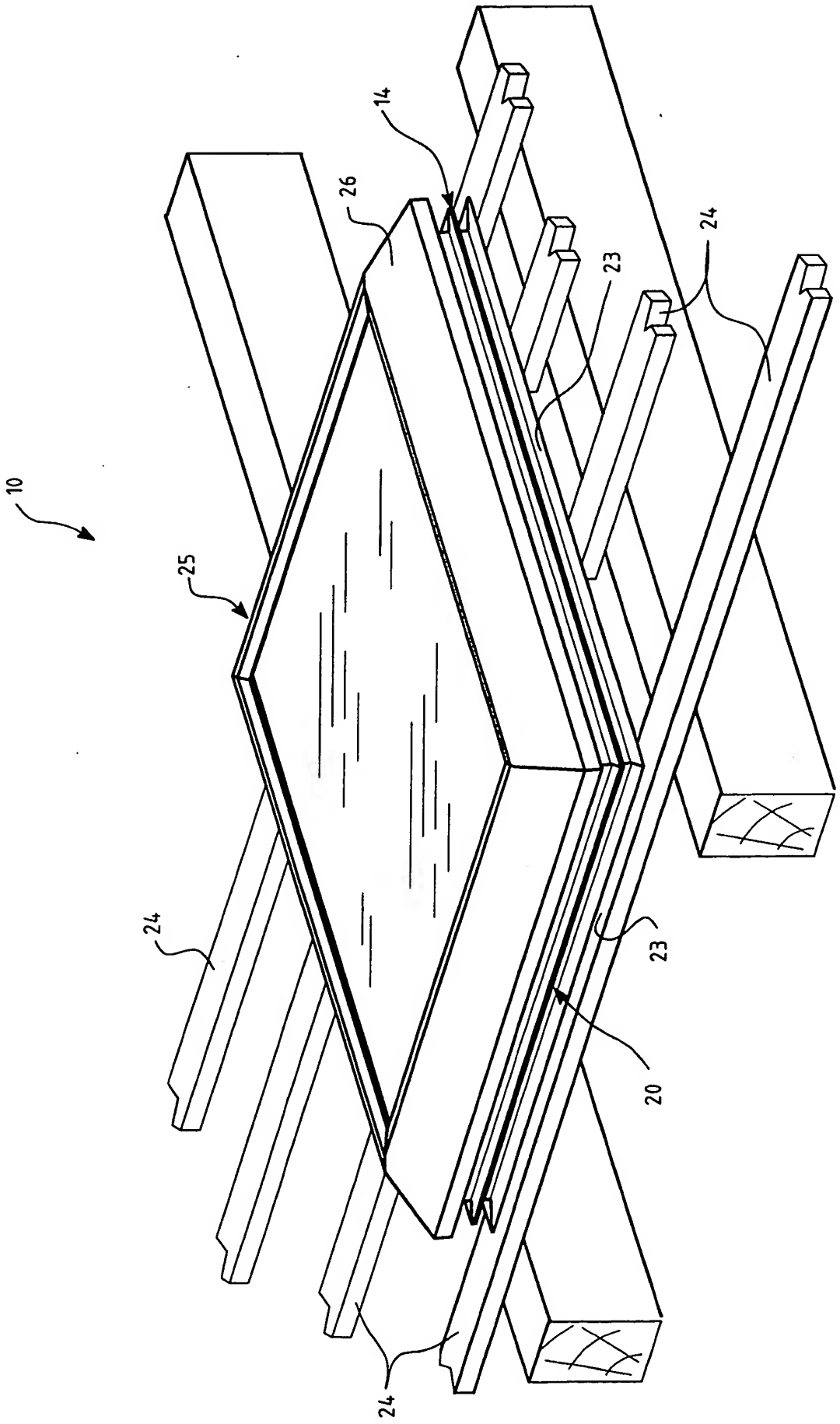

Fig. 1

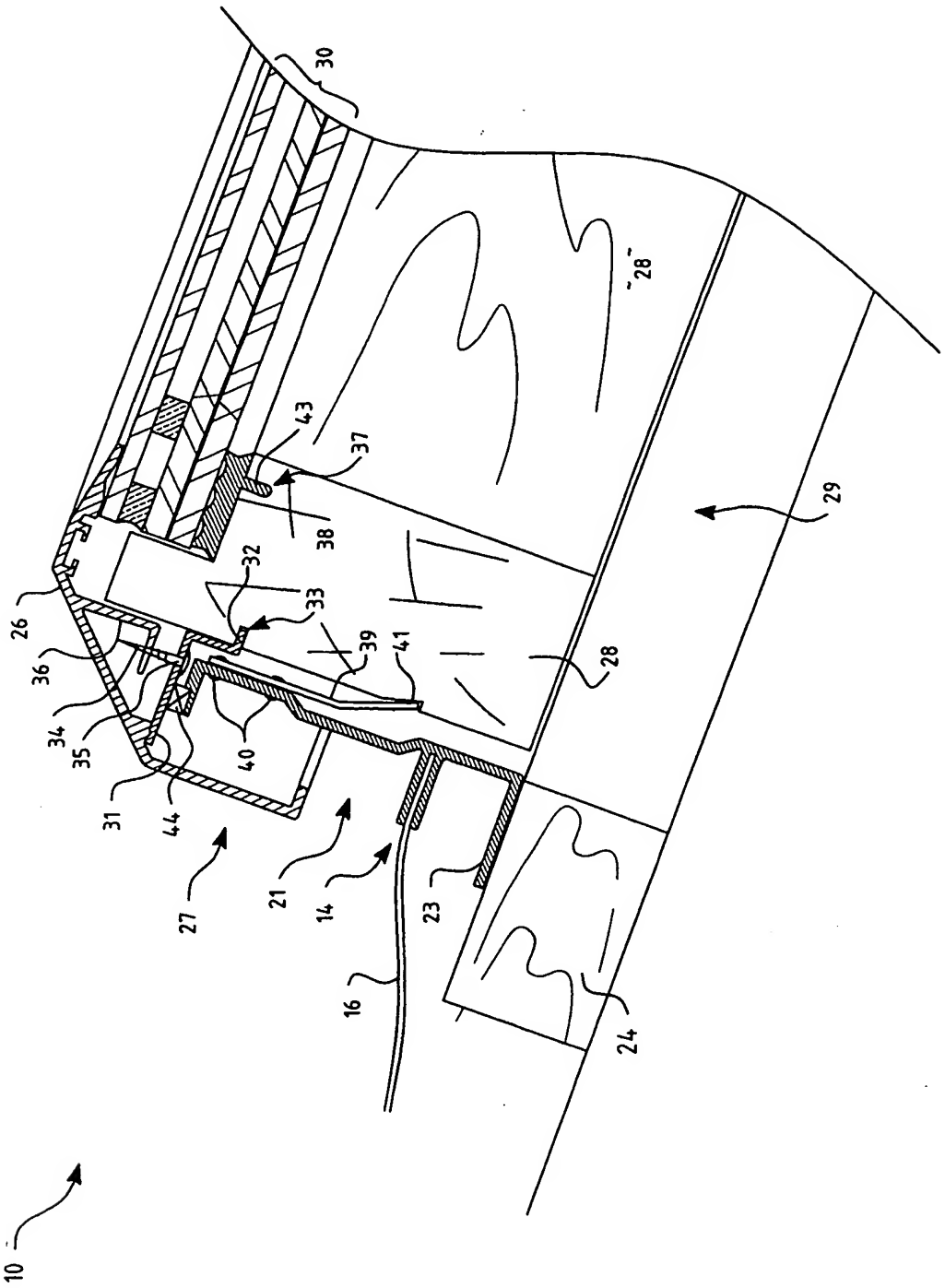

Fig. 2

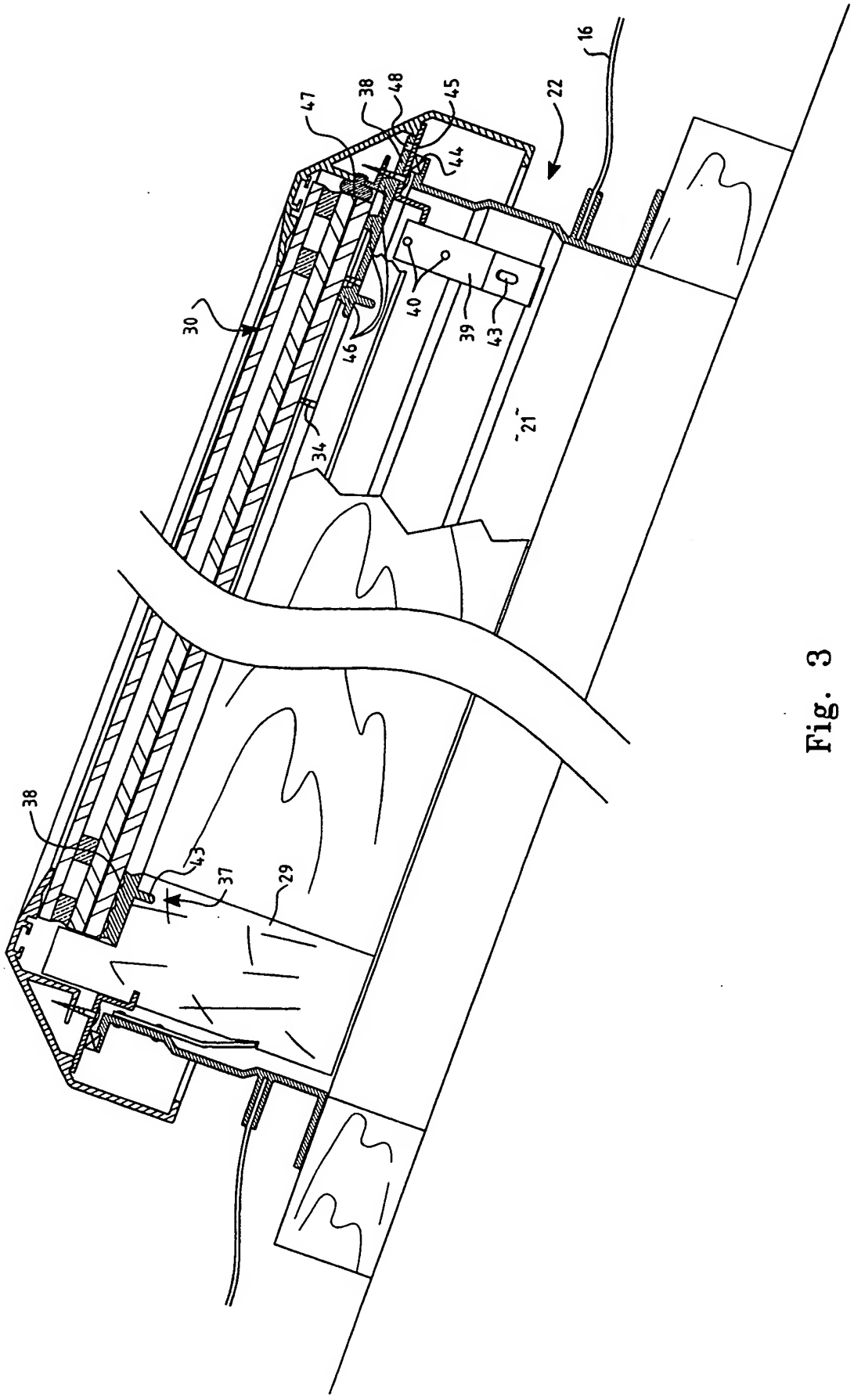

Fig. 3

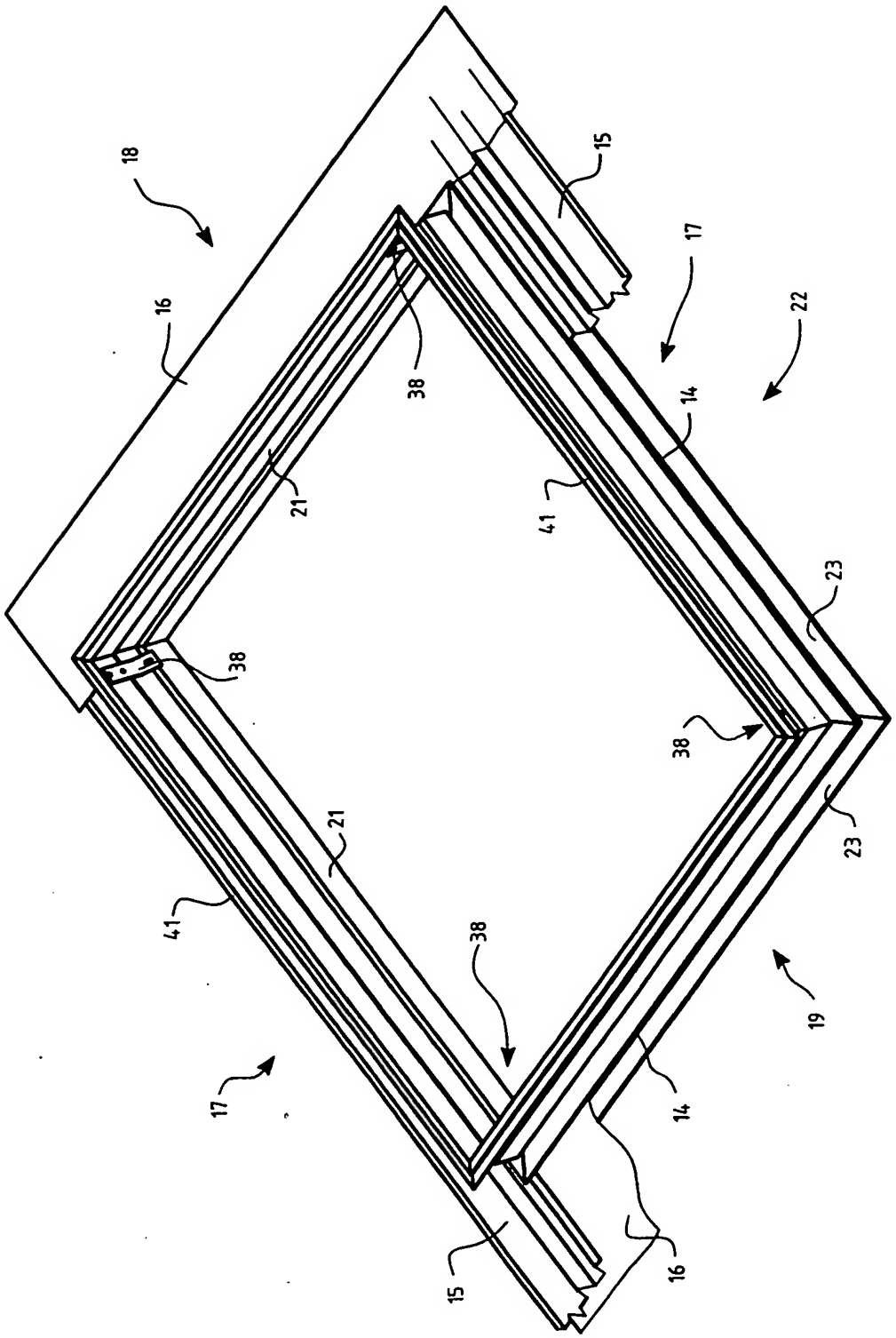

Fig. 4

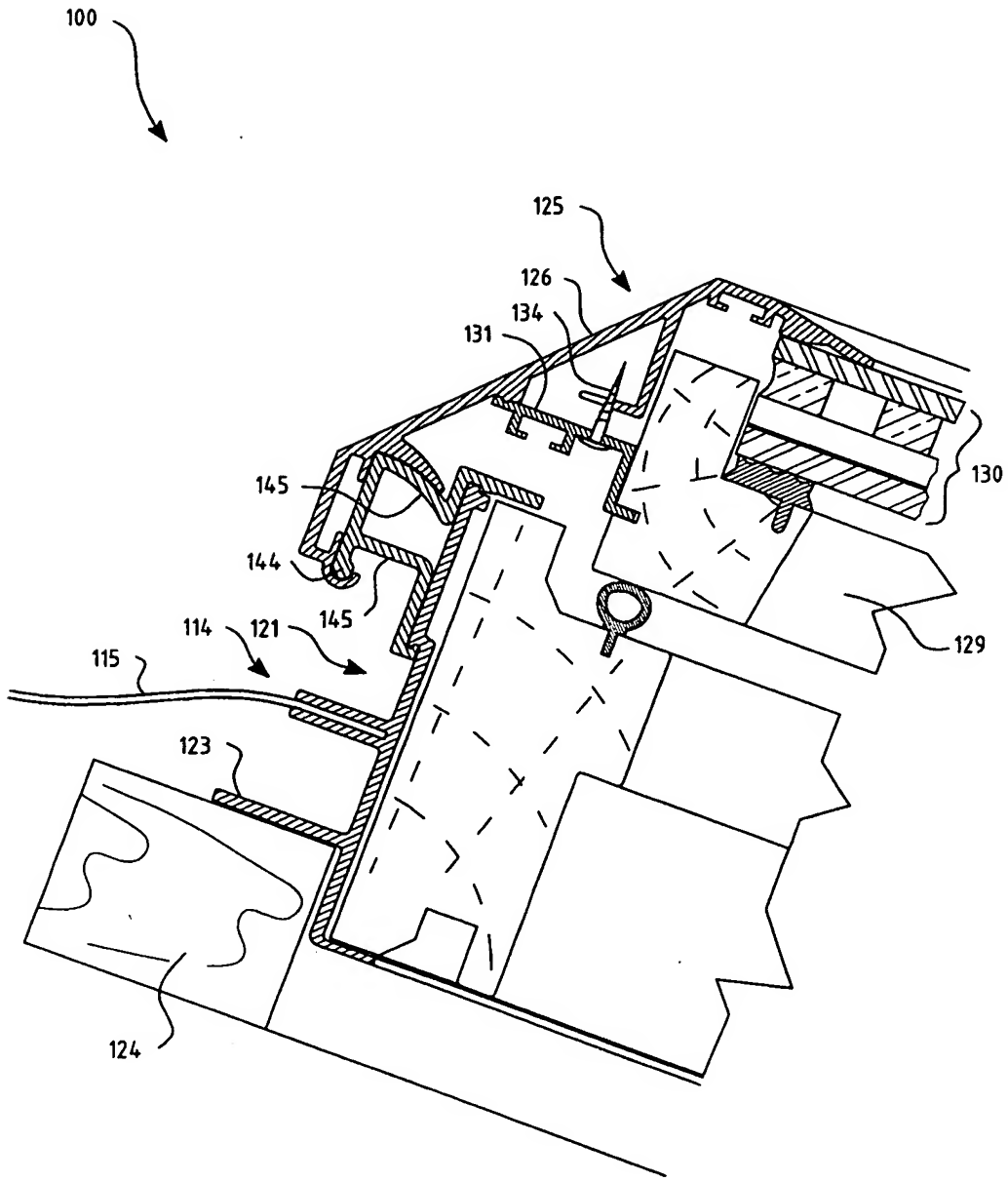

Fig. 5

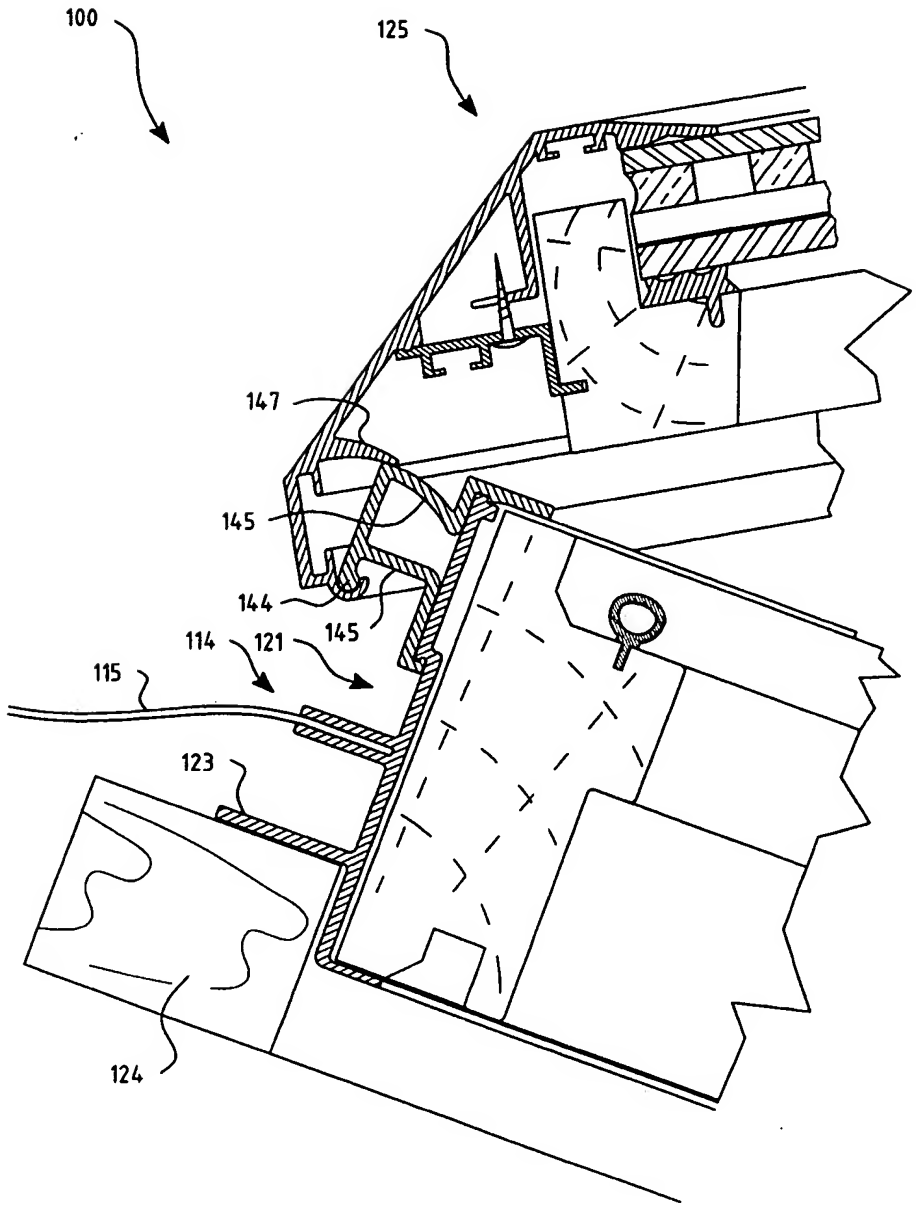

Fig. 6

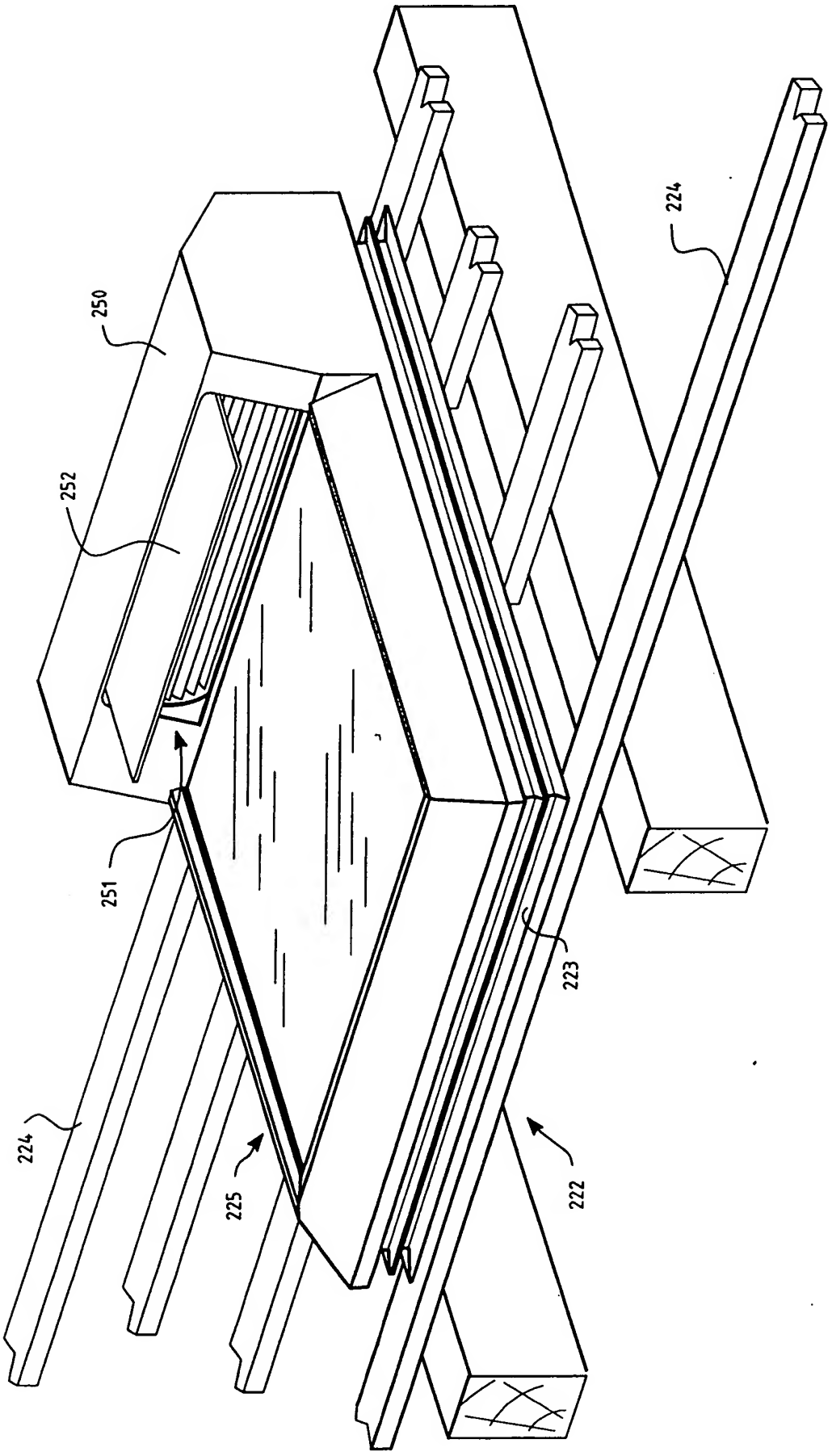

Fig. 7

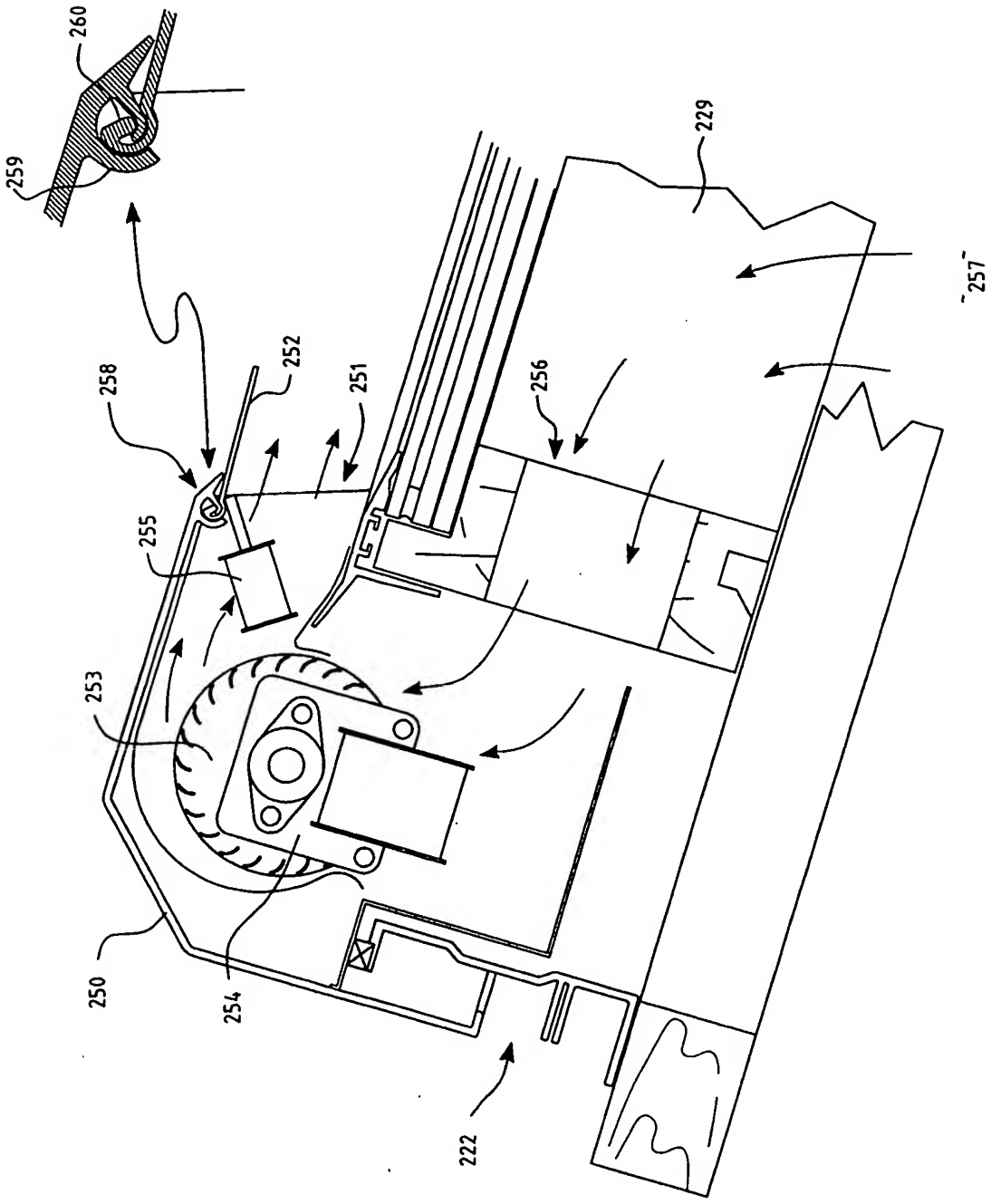

Fig. 8

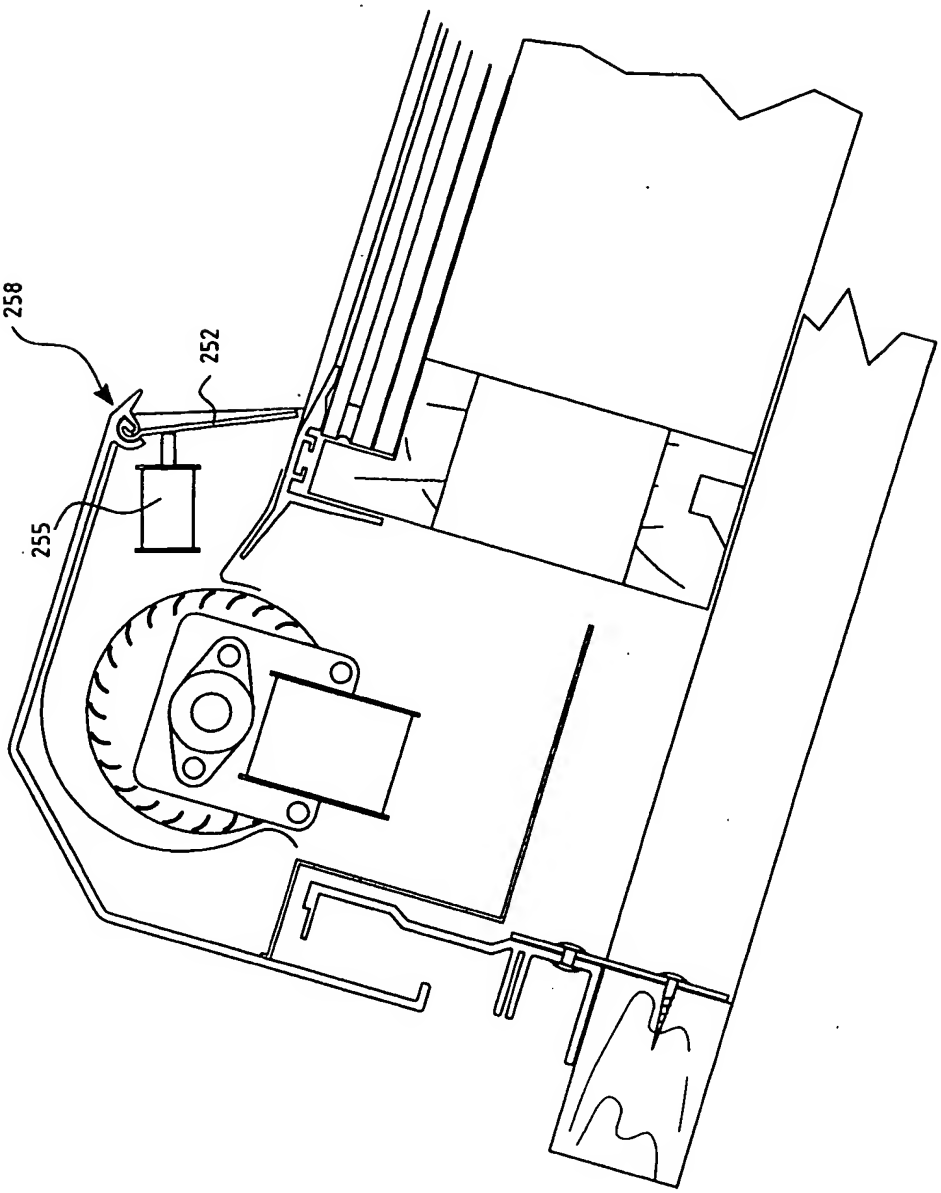

Fig. 9

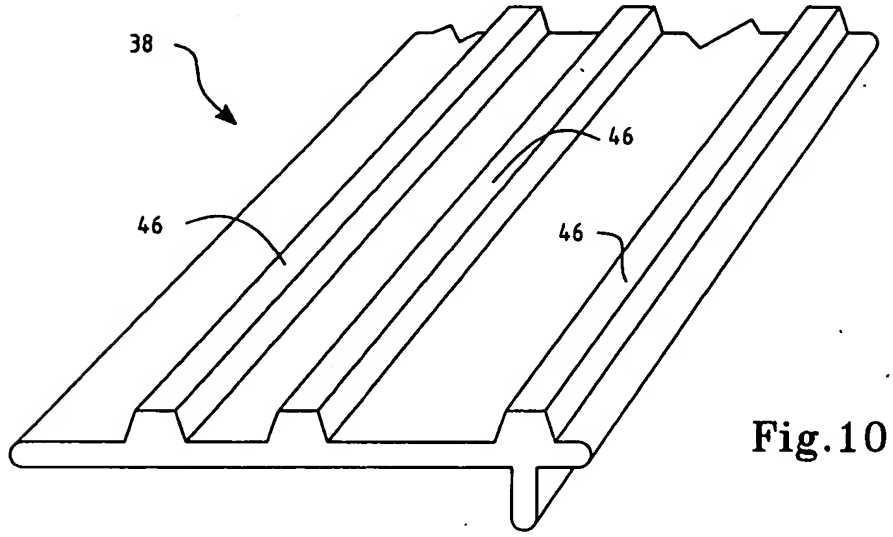

Fig.10 A

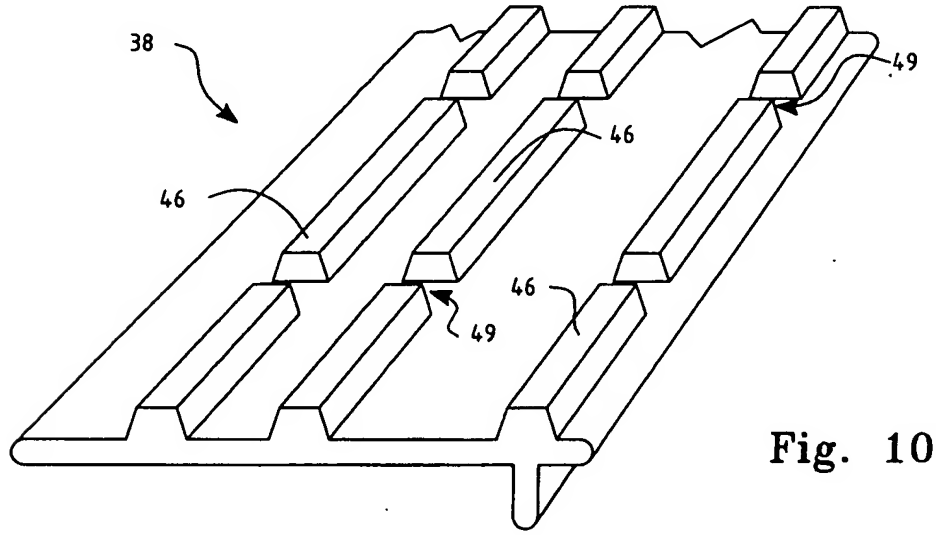

Fig. 10B

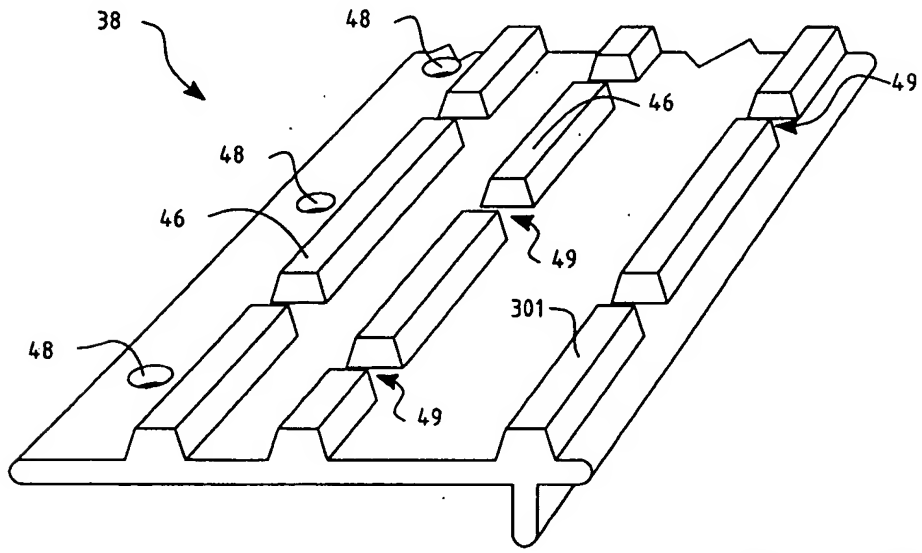

Fig. 10C

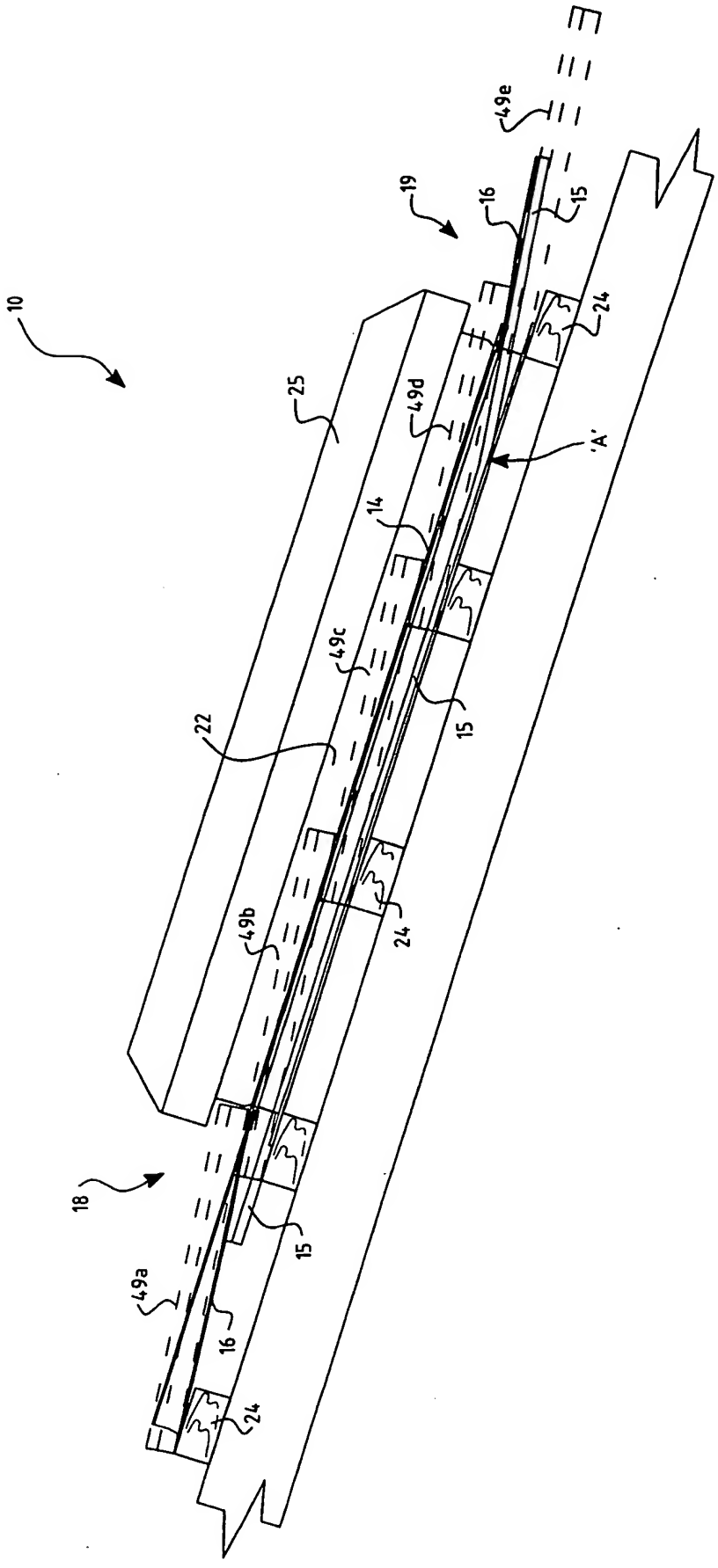

Fig. 11

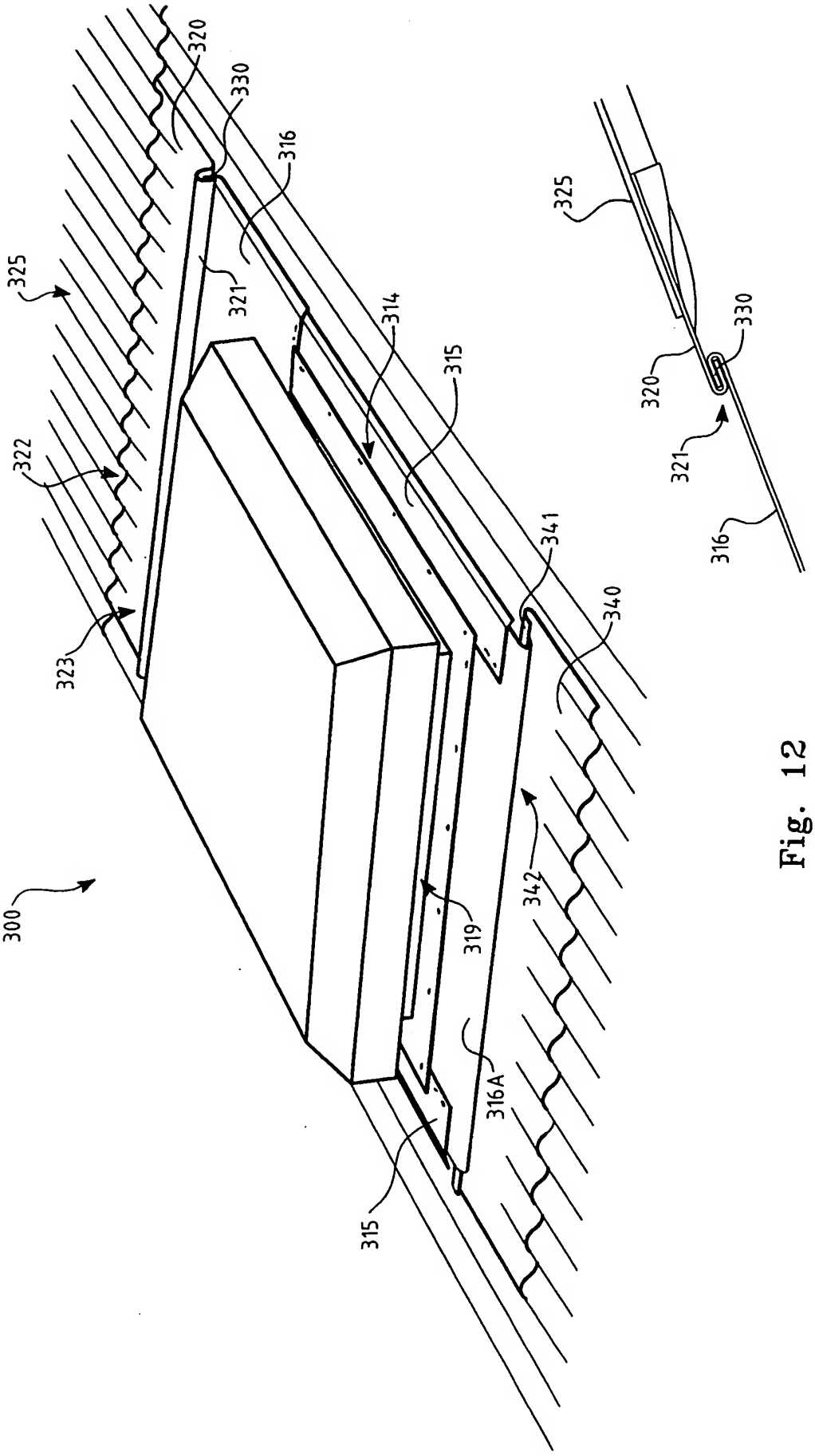
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Fig. 12